8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:
☐ nationally ☒ statewide ☐ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G N/A

Areas of Significance (enter categories from instructions)
Engineering
Maritime History
Transportation

Period of Significance
1908-1913

Significant Dates
Dec. 1913

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder
Lynchburg Foundry Co., Lynchburg, VA
Tatnall-Brown Co., Wilmington, DE

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Miah Maull Shoal Lighthouse is a well-preserved embodiment of the cast-iron and concrete caisson foundation technology which was used from 1876 to 1913 in lighthouses that occupied waterbound sites in the northeastern United States. At least 50 such lighthouses were built. Miah Maull Shoal, designed in 1907 and completed in 1913, was the last example of this type built before reinforced concrete technology was introduced; it was also one of the last major navigational aids built in the Delaware Bay. As part of a string of lighthouses in the bay and the lower Delaware River that were in place before World War One, Miah Maull Shoal helped foster the improved navigation of the Delaware that was crucial to the success of the Hog Island Shipyard (now the site of the Philadelphia International Airport), which was established in 1917. By the end of the conflict, Hog Island had become the largest shipyard in the world. Miah Maull Shoal Lighthouse meets Criterion A under the category of Transportation and Criterion C under the category of Engineering, as an embodiment of an important engineering technology.

The Miah Maull Shoal itself, which was named for an eighteenth-century Delaware mariner, was 800 yards wide and 3,000 yards long at a depth of 13 feet — a significant hazard to large modern ships, which required a much greater draft. The need for a deep channel, both for commercial and for military purposes, was foreseen during the early years of this century. Now known as the Philadelphia Ship Channel, it was called for by Congress in the River and Harbor Act of 1909 to be a 35-foot deep channel at least 800 feet wide from the Philadelphia and Camden wharves and shipyards to the mouth of Delaware Bay, to replace an existing 600-foot wide, 26-foot deep channel begun in 1885. Subsequent improvements have deepened the channel to 40 feet.

Miah Maull Shoal Lighthouse was designed as one of the major navigational aids required for this channel. Appropriations to build it were approved by Congress in acts of June 30, 1906, March 4, 1907, and March 4, 1911. The lighthouse was designed during 1907-08 to employ a pre-fabricated conical cast-iron shell resting on a foundation of pilings surrounded by riprap. In this method of construction, the shell was pre-fabricated, towed to the site,

☒ See continuation sheet

and sunk by filling it with concrete. The contract for the shell was awarded in May 1908 to the Lynchburg Foundry Company, of Lynchburg, Virginia, even before site work began. The plates were delivered to Wilmington, Delaware, where they were subsequently assembled and the shell floated. Work at the site was started on July 24, 1908. The Coast Guard towed the shell to the site in August 1909, and the sinking and filling was completed by November. In June 1910, with the building's superstructure under construction, Engineering News described the emerging edifice.

> The foundation shell is 40 ft. in diameter at the base and 42 ft. 8 ins. in height. It is composed of 224 1+1/4-in. cast-iron plates in seven courses, the top course being bell shaped.... The superstructure will consist of a three-story iron dwelling....

The superstructure of Miah Maull Shoal Lighthouse was completed on February 20, 1913 and its permanent fog signal was placed in operation on December 5, 1913.

Less than one year later, the Great War erupted in Europe. As part of the American response, the United States commissioned a great number of new military vessels. In September 1917, after the American entry into the war, the American International Shipbuilding Corporation was awarded a contract to build fifty large cargo ships, and in the following month a subsequent contract added seventy more, all to be completed before the end of July 1919. To meet this extraordinary demand, the company secured Hog Island, a large island along the west shore of the Delaware River just south of the confluence of the Schuylkill River. In a crash construction program from September through December 1917, the company built the Hog Island Shipyard in order to fulfill its contract, which could not be handled by existing shipyards in the Delaware Valley. The ships produced by the Delaware River shipyards for World War One proved the need for the Philadelphia deep channel and its value for national security. Of the navigational aids in the Delaware, the Miah Maull Shoal Lighthouse most clearly represents the improvements of this period.

Modernization Program

Under the July 1983 Modernization Program - with a December 1985 supplement - the same Command placed a contract with Maida Engineering Inc. for electrical, mechanical and structural work (structural work essentially called for welding of steel plate in connection with the electrical mechanical details). The work included the removal of outmoded equipment, accessories and conduit; and the installation, connection and purchases/government furnished of up-to-date replacements. Modernization had been underway, weather permitting, for at least three years when the program was completed in the fall of 1988.

A systems approach, including on-shore supervisory control, covered shore power and on site emergency energy, emergency light flashing, fire protection, fluorescent lighting, fog and halon signal and environmental conditions. The emergency energy system and almost all of the new equipment was installed and connected in the first floor. The high voltage cable, power cut-outs, fuel tanks, ground connections, and surge arrestors went to the vault in the basement. Marine plywood covering was put over windows and sashes, steel plates welded to port openings and hatch covers and all other openings filled in with materials matching the contiguous materials for environmental control.

During the modernization program - but not specified in it- the roof gallery was removed due to deterioration with serious hazards and to excessively high cost to repair or replace. A steel security door was installed over the original wooden double door entrance to the tower. Although covered, the one-over-one sashes were not disturbed.

Historic Resource Consultants' supplement to the firm's December 1, 1982 Site Visit Report brings out that the walls of the living quarters as well as the walls of the staircases and watch deck are panelled with wood-fiber. No drawing or bill of materials has come to light to provide clear-cut details on the panelled walls. Instead, one of the 1983 modernization drawings shows an existing bulkhead detail for the first floor with an interior T. & G. wood wall. A reasonable inference from the Third District Civil Engineering Command's 1948 drawings indicates the likelihood of panelled wood walls. The drawings were for the rehabilitation of the living quarters, but no mention of walls was made in them.

The lighthouse keepers occupied the living quarters until 1975.

Sources:

1. Office of Superintendent of Lighthouses Prints of Improvements to Machinery for Fog Signal Drawings dated August 1938.

2. U.S. Coast Guard Third District Civil Engineering prints of A.C. Electrification drawings dated May 13, 1958.

3. U.S. Coast Guard Third District Civil Engineering Prints of Modernization Drawings and Bills of Materials dated July 28, 1983.

4. Historic Resource Consultants supplement to the firm's December 1, 1982 Site Visit Report.

All four sources carry "Miah Maull Shoal Lighthouse" in their captions. All prints of drawing and bill of materials provided by the Shore Maintenance Detachment, Ninth U.S. Coast Guard District. Site Visit Report provided by Bruce Clouette, Partner.

Historical Physical Appearance

Foundation

The foundation, painted gray, is 40 feet in diameter at the bottom, tapers inward to a neck of 30 feet diameter. Above the neck, it flares out to create a trumpet shape. The foundation is 43 feet in height. A caisson (foundation shell) was erected on shore near Wilmington, Delaware. It consisted of seven courses (levels) of cast iron plates connected to each other with bolts through internal flanges. The shell, partially filled with concrete, was towed to the site where it was placed upon a steel cylinder footing and set in concrete on 187 white oak piles previously driven 22 feet into the shoal bottom.

Then a 40' wide bank of riprap (broken rock loosely thrown together) was placed around the footing to prevent scouring. Concrete was poured into the unfilled space in the shell, leaving some 10' at the top unfilled to serve as a basement area. Six round portholes ventilated the basement.

Basement

Space existed in the basement and in the foundation courses for an air tank, a boiler, a cistern, a coal room, and oil room, a vault and a water tank. The 4.0' x 9'2" vault with an entrance from the basement floor is

placed largely in Course #5. These utilities are essential for the comfort of the keepers and for the operation of the lighthouse.

Several of the other cast iron plates in Courses #4 and #6 are modified for run-off of cistern overflow, sink waste and water closet waste. Course #5 takes care of the mooring rings on the boat landing platform. The cornice of the tower is connected to plates in Course #7.

A chimney which provides for two 8" x 8" flue openings for furnace gases and smoke is otherwise embedded in reinforced concrete for five feet below the first floor. An oblong chimney with a 16" diameter extends to the roof along the brick lined wall plates to the roof of the third floor. A flue opening is on each of the three dwelling floors. From the third roof, the chimney is held in place by a chimney stay fixed to the edge of the lantern floor balcony. The chimney is then in place beyond the lantern floor levels with the base of the ventilator ball.

A ladder 17-3/4" wide and 16'1" tall stands from below and above mean low water and mean high water and is attached to the landing platform. The railed landing platform measures 3'9-1/2" x 2'1-3/4". Another ladder with the same width as the platform stands 11'7" and is fixed to the first deck under a 2'0" x 2'0" landing hatch.

There are two boat landings and ladders, one on the west side and another on the east side of the tower.

Tower

The tower, 59 feet above mean high water, also is cast iron (brick lined) with plates bolted together with internal flanges. It accommodates in ascending order, a three-story dwelling area, a one-story watch deck and a lantern deck. A roofed veranda features a cast iron piped rail encircling the deck of the first story. Smaller railings are around the watch and lantern decks.

A center column is the interior structural element of the tower extending from the basement floor to the top of the watch deck (fourth floor). It is cast iron 3/4 inch thick with an 11 inch inside diameter. There are a total of four 3-1/2 x 10 inch column circular openings covered with sheet iron doors: two such openings in the basement and one each on the third and fourth floors. The center column stands in a 2 feet 6 inch square cast iron floor plate on the basement floor.

The associated structural strength of the center column comes from the cast iron plates of the tower wall interconnected between the three dwelling floors and the watch deck. In the case of the dwelling area, the individual wall plates are uniform in size, are classified as either inside or outside elevations and are slightly different in numbers, in keeping with the varying radii. In comparison, the wall plates of the watch deck are smaller in size, are fewer in number, but are likewise either inside or outside elevation and for the same reason.

All wall plates reflect a similar design, form the contours of the tower, have raised edges and are bolted together. Windows and doors for the dwelling and watch tower are cut out of the exterior plates. Holes are drilled into the wall and floor plates for downspouts and pipes leading to the basement facilities.

A 3" I beam is placed across the top of the watch tower, beneath the lantern floor.

Cast iron floor plates connect the dwelling tower wall plates to the center column. In a similar vein as the wall plates, the floor plates are uniform in size and are in different numbers depending upon the respective radii of the dwelling and watch tower. The vertical section of the first floor is fitted with T-iron supports, both the vertical and horizontal sections of the second floor are fitted with similar supports, and the horizontal section above the third is likewise supported.

A staircase is cut out of the floor plates on the south side of the tower for each of the three dwelling floors. Another cut-out on the first floor provides for a trap door covering the coal chute to the coal room in the basement.

Two 5" I-beams are in place on the first floor, another on the second floor and still another on the third floor. Three of the beams extend from the wall plates to the center column. The second I-beam on the first floor is at a right angle to the other I-beam.

Wood floor 2" thick overlays the cast iron floor.

In sum, the circumference wall plates and the central column, all cast iron, are the structural elements of the tower. Collateral support flows from the interconnected cast iron floor plates and the steel beams.

Dwelling Area

The three-story dwelling area, each floor 9 feet in height, tapers from a base diameter of about 26 feet to a top diameter of some 23-1/2 feet. Seven windows on the first floor and eight each on the second and third floors have wooden one-over-one sashes in cast iron surrounds with molded lintels. A wooden double door in a cast iron frame, also with a molded lintel and with rectangular lights over recessed panels provides access to the dwelling area on the south side of the tower.

The dwelling area approximates a conventional home style with a kitchen and dining room on the first floor, with two bedrooms and a bathroom on the second floor and with two more bedrooms on the third floor. A pantry, storage room and four closets are appropriately located. Rooms are separated for privacy and for functional use by horizontal and vertical partitions essentially of channel and plate iron.

Dresser - 3'6" wide, 8'0" and 15" deep - with two-way doors, drawers and shelves and rimmed in iron plate is fixed to the first floor and the ceiling.

A roofed veranda encircles the first deck. The 5/32" sheet steel roof plates with 32 rafters are secured by flanges to the tower wall plates below the second floor windows. It has an approximate one foot slope from the tower wall plates to the 5" x 7" gutter, with three downspouts bolted to 7'8" columns. The twelve columns slip over 3-3/4" floor plate tenons. Sixteen 3'11-1/4" posts and the twelve columns are linked together by three levels of 1-1/4" pipe to form the cast iron Truscon railing around the first deck.

Watch Deck and Lantern Tower

In contrast, the diameter of the fourth floor (watch deck) and the lantern floor are considerably smaller than the 26' and 23-1/2' diameter of the three dwelling floors. The diameter of the watch deck is 15' and slightly more than 8' high. The diameter of the lantern floor is 8' in diameter and has a focal point of a little more than 5'.

The framing plan of both the fourth floor and the lantern floor provides for further structural support by the strategic placement of steel I-beams. Each floor has an I-beam across its diameter which is connected to the central column and to the wall plates. Other I-beams on each floor are either directly or indirectly attached to the central column and the wall plates.

A semi-circular iron staircase with separate up and down ways between the fourth floor and lantern floor is completely affixed to the central tower via cast iron floor plates. Three are eleven newel posts which support the handrail between the fourth floor and the lantern floor. The stairs in between are treaded.

Four round-arched windows with plain cast iron surrounds are set in a like number of outside wall plates of the fourth floor (watch deck). A pane of glass 20" x 20" is in place on each one over one 1-3/4" sash. Metal weather stripping is put in the crevices between the sash and the window frame.

A 1-3/4" thick metal arched door is the balcony entrance to the fourth floor. It has three separate panes of glass, the largest is arched and measures 16" x 28". A projecting molding is across the door near the threshold.

Pipe railings with orb-shaped finials (terminals pointed upward) encircle the galleries at the watch deck and the lantern deck. The watch deck railing consists of eight sections, each one with four posts standing 3' high bolted through a 3" steel I-beam below deck and with twenty-four 3/4" vertical pipes and three 1/2" horizontal pipes. In comparison, the lantern deck is comprised of six sections, each one with three posts also standing 3' high bolted through a 3" steel I-beam below deck and with ten 3/4" vertical pipes and three horizontal pipes.

In short, the railings are cast iron, shouldered and riveted. Excluding the finials, a watch deck section is 3' x 6' and the lantern deck section 3' x 4'.

The Lantern

The circular plan lantern stage has walls of cast iron plate below its diagonal lattice-glazed window which extends completely around the lantern. Sheet metal covers the pitched roof of the lantern and is surmounted by a ventilator ball with lightning rods.

Augustin Fresnel, a French physicist, perfected a lens in 1822 that revolutionized the lighting of lighthouses by simplifying the maintaining of a good light. Fresnel devised seven orders, or sizes, of lenses depending upon the power of light needed. The first-order was the largest and gave the most powerful light. The smallest was a sixth order lens. (There was also a three-and-a-half order lens).

The Fifth Auditor dragged his feet on accepting the superiority of the Fresnel lenses so that by 1851, only three light stations in the United States were equipped with the lenses. And they came about by the special acts of Congress. Congress also stipulated that Fresnel lenses were to be placed in all new lighthouses and in lighthouses that needed new lighting apparatuses.

Congressional action brought about a change in the administration of lighthouses from the Fifth Auditor (1820-1852) to the Lighthouse Board (1852-1910).

In the 1870's the Lighthouse Board once again undertook experiments seeking a better fuel. In 1878, the Board began introducing kerosene, or mineral oil, into lighthouses. The slowness in introducing mineral oil was due to the fact that the lens lamp had to be converted to use the new fuel.

The Fresnel Lense and the kerosene fuel were still in general use when the initial Congressional appropriation was made for the Miah Maull Shoal Lighthouse on June 30, 1906 and when the lighthouse was in the 1907-08 planning stage. Both found their way into the structure of the lighthouse during the 1909-13 construction stage.

Whatever its design and construction the top deck (tower) has one primary mission: to support the light the mariner needs to see. The lighthouse is principally a nighttime aid and, as a consequence, the most important aspect of the lighthouse is the light.

The top deck of the Miah Maull Lighthouse is fitted with a Fresnel lantern (1-1/2' x 3') which encloses a fourth order lens, a hydraulic lamp and a rotating or clockwise mechanism. Kerosene is inventoried and kept in the basement as fuel for the lamp. The lantern, under the lighthouse keeper's surveillance, creates the light characteristics for protecting nearby navigation.

The lantern occulates white at 4 seconds with a nominal range of 15 nautical miles for the white sector and 12 nautical miles for the red sector. The arc of the red sector extends approximately from northwest to southwest and covers the Brown and Joe Flogger shoals along the main shipping channel.

A series of prisms held in brass retainers form a vertical cylinder and the lens concentrates the light from the lamp into a narrow intense beam. Red plastic affixed inside the lantern's glazing causes the beam.

The source of the light is the incandescent oil vapor lamp. Kerosene is forced into a vaporized chamber where it strikes the hot walls and is instantly changed into a vapor. The gas goes through a series of small holes to a mantle (fabric net).

This lamp was the final step in the refinement of the flame. Subsequent improvements in lighting went beyond fire to electricity and now to solar energy.

Source:

Prints of 22 drawings with Miah Maull Shoal Lighthouse in caption provided by Shore Maintenance Detachment, Ninth U.S. Coast Guard.

MIAH MAULL SHOAL LIGHT

Light List Number: 37980 (Volume I)

Geodetic Position: 39-07.6 North, 75-12.6 West

Lamp: 1000 Watt

Lantern: 4th Order Classical Fresnel

Characteristic: Occulting White at 4 second interval

Nominal Range: 15 nautical miles (white sector); 12 nautical miles (red sector); red from 137.5 degrees true to 333 degrees true

Power Type: Commercial power via submarine cable

Horn: 1 blast every 10 seconds (1 second blast)

Emergency Light: Of lower intensity with same characteristic as main light if main light is extinguished.

Located on north end of shoal

Shoal dimensions: 800 yards X 3000 yards - 13 foot depth

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Drawings

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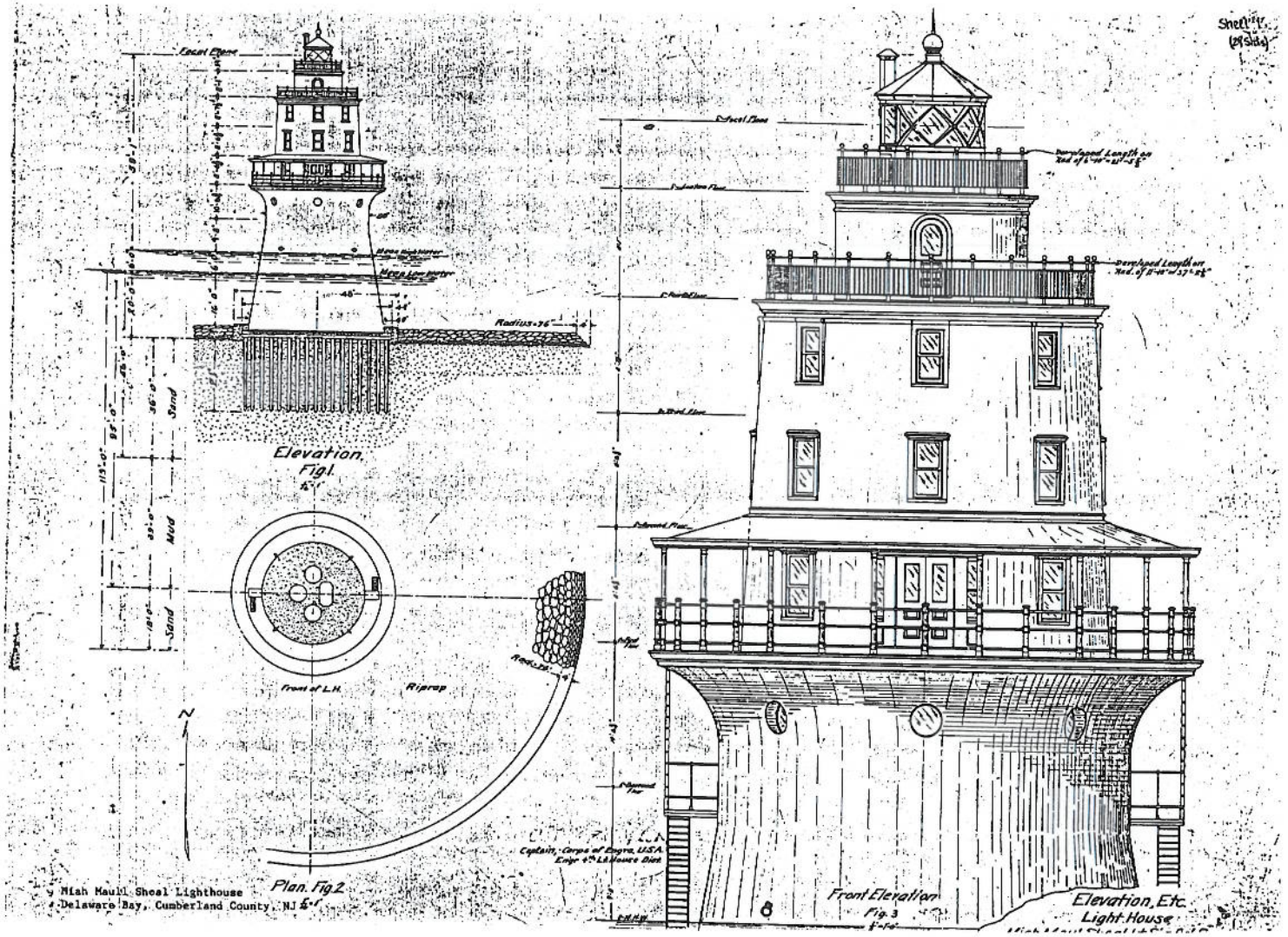

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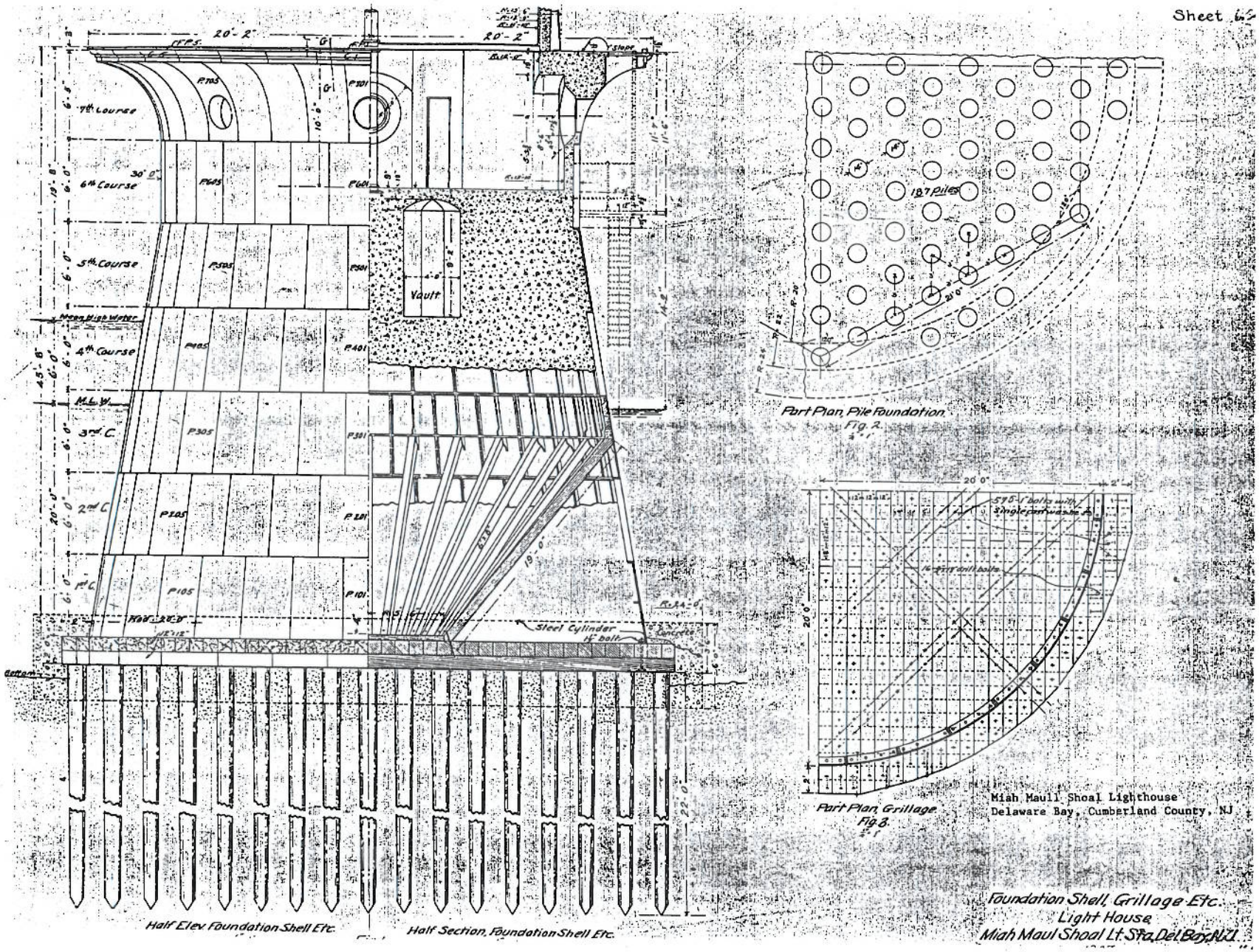

Miah Maull Shoal Lighthouse
Delaware Bay, Cumberland County, NJ

Foundation Shell, Grillage Etc.
Light House
Miah Maul Shoal Lt. Sta. Del. Bay, N.J.